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News shocks at the local level: Evidence from a conditional Covid-19 containment measure

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ABSTRACT

To reduce the spread of Covid-19 whilst limiting the economic costs of containment policies, governments have introduced geographically-flexible conditional restrictions – measures targeting sub-national areas whose severity depends on the virus's local incidence rate. I analyze whether conditional measures impact transmission rates via a *news-shock* effect – that is, by incentivizing indirect actions in anticipation of the policies being carried out. Exploiting a natural experiment from Romania in a regression-discontinuity framework, I provide early empirical evidence in this sense: I find that the Covid-19 incidence rate fell significantly in targeted constituencies following the announcement of a conditional containment measure, but *prior* to the policy being implemented. My results add to a broader literature on news-driven fluctuations, wherein expectations of future policies can impact immediate behaviors. I conclude by discussing an important avenue for future research.

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1. Introduction

To contain the spread of Covid-19, political leaders have implemented large-scale non-pharmaceutical interventions or "lock-downs" (Flaxman et al. 2020). However, the evidence suggests that, while effective (Hartl et al. 2020), large-scale restrictions impose great socio-economic costs (Adams-Prassl et al. 2020; Pulejo and Querubin 2021; Brodeur et al. 2021). Attempting to balance the costs and benefits of restrictions (Shiva and Molana 2021), governments have turned towards less socially-disruptive measures that may still sufficiently alleviate the virus's health-system burden (Spiegel and Tookes 2021).

Of particular note for my purposes are *local conditional containment measures* [LCCMs] – restrictions targeted towards specific sub-national geographical areas (e.g., constituencies), whose imposition and severity depend on the local Covid-19 transmission intensity.² In Romania, LCCMs were widely employed – for instance, the closure of certain businesses in constituencies with more than 1.5 Covid-19 cases per one thousand residents, or mobility restrictions when the transmission intensity surpassed three per a thousand.³

Analyzing the impact of LCCMs is insightful economically given the potential channels by which these measures may reduce the transmission intensity – illustrated in Fig. 1. On the one hand, via what I term the *mechanical effect*, the restrictions themselves help contain the spread. For instance, local school closures reduce transmissions by limiting student interactions (Amodio et al. 2021).

More interestingly, however, via the *news-shock effect*, LCCMs incentivize individuals to take indirect, independent actions which come at a personal cost in order to contribute to a public good: preventing or removing restrictions on their local community. To exemplify, individuals may take actions such as a non-mandated wearing of face-coverings or social-distancing (Mitze et al. 2020), or may engage in behaviors such as test avoidance (Thunström et al. 2021) to reduce the (reported) local transmission rate.⁴

Nevertheless, while some evidence exists suggesting that LCCMs are effective (Laydon et al. 2021), the scholarship has not yet empirically determined if, independently of any mechanical impacts, the news-shock effect of LCCMs is meaningful, an effort

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² An example being the three-tier system the UK government imposed in October 2020 (Iacobucci 2020).

³ See <https://bit.ly/34nUYF6>, or <https://bit.ly/3bXCE3k> (in Romanian).

⁴ As I further discuss in Section 4, I do not take a normative stance by distinguishing between what might be perceived as socially-desirable – e.g., wearing face-coverings – or undesirable – e.g., test avoidance – behaviors. Rather, I focus on the aggregate set of indirect actions that are undertaken at a personal cost to reduce the reported transmission intensity (i.e. the number of positive cases per a thousand inhabitants) and, thus, remove or prevent restrictions.

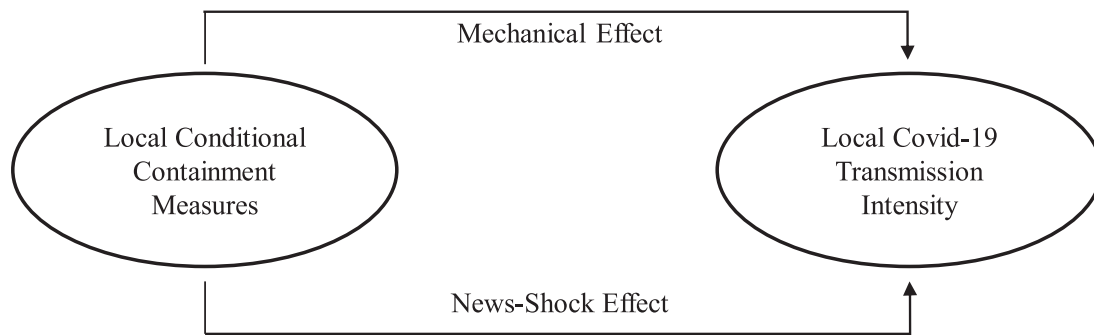


Fig. 1. The Effect of Local Conditional Containment Measures – Theoretical Mechanism Decomposition.

which I argue is valuable both policy-wise – adding to our understanding of the costs and benefits of geographically-flexible restrictions, and economically – exploring how expectation changes impact the actions of forward-looking agents (Arezki et al. 2017) and how, in times of crises, individuals engage in personally costly behaviors to contribute to a local public good (Barron and Nurminen 2020).

I address this literature gap. By exploiting a natural experiment, I provide early evidence for the existence of a causal LCCM news-shock effect.

Concretely, I investigate an LCCM in Romania which mandated that a significant fraction of a constituency's middle and high-school students could not physically attend classes if the local transmission rate exceeded one in a thousand. Crucially, no other restrictions were imposed at this threshold neither shortly before or after the policy's announcement, and the LCCM was communicated to the public five days before schools reopened following the Easter holidays.

Exploiting these appealing features in a regression discontinuity [RD] framework, I document a sharp causal decline in the Covid-19 reported transmission intensity taking place after the announcement, but *prior* to the end of the holidays, when comparing constituencies situated close to the threshold. The estimated effect is economically-meaningful, suggesting that the announcement led to an average fall of 0.1–0.2 cases per a thousand residents, with the largest impact retrieved the day prior to schools restarting.

I argue that future work can build upon my findings by extending their external generalizability and identifying what actions drive the news-shock effect.

2. Background: Romania's hybrid schooling policy

I briefly describe Romania's policy which allows me to corroborate the existence of a causal LCCM news-shock effect.⁵

Communicated on the 29th of April 2021 by Romania's Ministry of Education, the LCCM mandated the implementation of a hybrid online schooling system in all constituencies where the Covid-19 transmission intensity exceeded one per a thousand residents – illustrated in Fig. 2.

Starting from the 5th of May, students in grades five through seven, and those in grades nine through eleven would not be allowed to physically attend classes. The scale of the policy was therefore substantial, with three quarters of middle and high-schoolers, or roughly one million students being potentially affected.⁶ In constituencies with a lower transmission intensity, the policy imposed no restrictions.

⁵ My aim is to describe the policy's appealing features for the purposes of my empirical analysis, rather than to provide an exhaustive overview. For further details on the policy, see <https://bit.ly/3fZ2f3C> (in Romanian).

⁶ Calculation based on student numbers from Romania's National Institute of Statistics, <https://bit.ly/3wGaLeG>.

Three reasons make this setting suitable for my purpose. First, I can exploit the existence of a clear threshold in the policy's geographical scope to isolate the LCCM's causal effects. Since I am interested in the news-shock channel exclusively, I use the incidence rates reported for the 29th of April to code the forcing variable in the RD specification – as discussed below.

Second, the LCCM was announced roughly five days prior to the vacation ending, thus creating a time-window in which the public was informed of the policy while no measures were yet enforced. It is this announcement-implementation time-lag that allows me to assess whether indirect actions may partially explain an LCCM's effects.

Finally, and just as importantly, no other restrictions were enforced at the one per a thousand Covid-19 incidence threshold⁷ neither after or shortly⁸ before the schooling policy's announcement, allowing me to isolate the LCCM's news-shock effect from the confounding influence of other measures.

3. Analysis

I use a sharp RD design (Imbens and Lemieux 2008) to estimate the policy's news-shock effect.

First, I define the forcing variable for each constituency i :

$$\text{MARGIN}_i^{29\text{April}} = \text{COVID-19 INCIDENCE RATE}_i^{29\text{April}} - 1$$

where the virus's incidence rate – capturing the fourteen-day case notification rate per a thousand residents reported on the 29th of April – is retrieved from Romania's Health Ministry. Next, I construct my treatment variable $\text{TREAT}_i^{29\text{April}}$, equal to one when $\text{MARGIN}_i^{29\text{April}}$ is positive (zero otherwise).

To estimate the LCCM's (local) average treatment effect [LATE], I restrict my sample such that $\text{MARGIN}_i^{29\text{April}} \in [-h, +h]$, where h is computed using the algorithm in Calonico et al. (2014), and run:

$$Y_i^d = \alpha^d + \gamma^d \text{MARGIN}_i^{29\text{April}} + \beta_0^d \text{TREAT}_i^{29\text{April}} + \beta_1^d \text{TREAT}_i^{29\text{April}} * \text{MARGIN}_i^{29\text{April}} + \rho^d X_i + \epsilon_i^d$$

⁷ As discussed, other LCCMs existed in Romania, but were enforced at the 1.5 or 3 per a thousand thresholds.

⁸ I note, however, that a similar system mandating hybrid schooling in constituencies where the incidence rate exceeded one per a thousand existed before the Easter holidays started at the beginning of April – see <https://bit.ly/2LzXg34> (in Romanian). One may then be concerned that the news-shock effects documented below may in fact be long-lasting mechanical consequences of the previous policy. Since my forcing is defined in terms of the infection rate recorded on the 29th of April, however, I argue that any such mechanical changes will have already taken place. The evidence supports this view. As shown below, the treatment and control constituencies do not differ significantly in terms of their incidence rate in the days predating the announcement. Moreover, in Figure B5, I show that no discontinuous effects can be identified in the holiday weeks predating the announcement, further diminishing the possibility that the long-lasting effects of the previous policy may bias the results below.

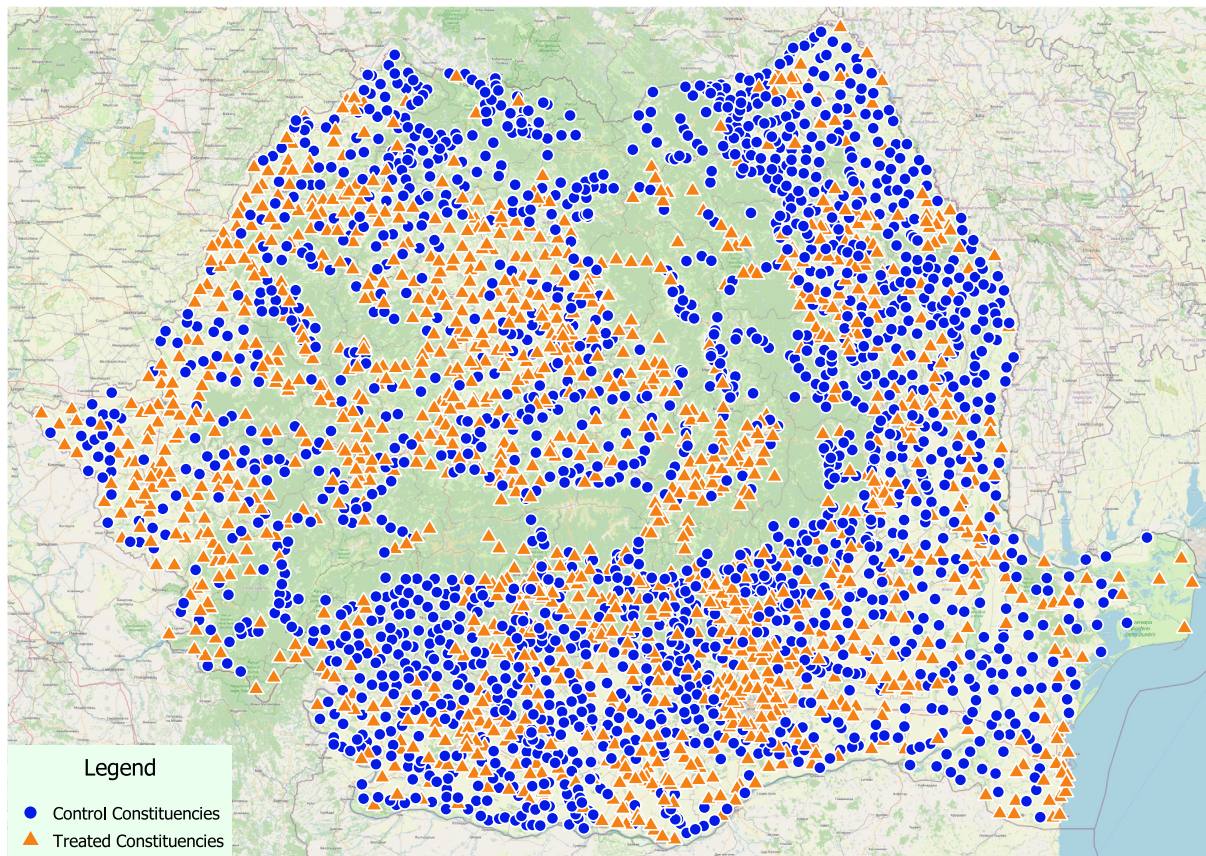


Fig. 2. The Hybrid Schooling Local Conditional Containment Measure — Classification of Constituencies. **Note:** The local Covid-19 reported transmissions rate was above (below) one per a thousand residents in treated (control) constituencies on the 29th of April 2021 — that is, at the time of the hybrid schooling policy's announcement. Out of 3180 constituencies, 1387 are classified as treated. Map created using QGIS.

Y_i^d captures the Covid-19 incidence rate reported for constituency i on day d . To quantify the news-shock effect, I focus on the five days between the 30th of April and the 4th of May.

β_0^d is the coefficient of interest. If the policy does lead to a reduction in the transmission incidence via the news-shock effect, I expect β_0^d 's estimate to be negative in the days prior to the Easter holidays ending. For efficiency, I include a vector of controls X_i .⁹ I use heteroskedasticity-robust standard errors.

The findings are reported in Tables B1 and B2. In Table B1, I give OLS results. In Table B2, I present the RD estimates. The RD estimates are also depicted graphically in Fig. 3, alongside their corresponding 90 percent confidence intervals.

Overall, my results provide early evidence for the existence of a causal LCCM news-shock effect. First, I am unable to reject the zero effect null hypothesis when considering the days before the announcement, suggesting that the RD framework is contextually valid.¹⁰ More importantly, I find that the policy's announcement led to a statistically-significant reduction in the Covid-19 reported transmission intensity in the days predating the end of the holidays on May 5th, a time-window where no restrictions were yet imposed.

The magnitude of the estimates also show that the news-shock effect is meaningful in terms of its magnitude. While no effects are retrieved on the day immediately following the announcement¹¹, the numbers estimated thereafter suggest that the policy

led to a reduction of between 0.1 and 0.2 cases per a thousand residents via the news-shock channel, with the largest figure retrieved for the final day of holidays — estimated at a reduction of 0.191 (95% C.I. 0.034–0.349) per a thousand¹², or just under twenty percent relative to the one per a thousand incidence rate threshold at which the policy was implemented.¹³

4. Discussion

Exploiting a conditional Covid-19 containment policy announcement, I provide evidence for a news-shock mechanism partially explaining the effects of local restrictions on the virus's transmission intensity. More broadly, my results add to a wider literature on news-driven fluctuations, which has documented how information on future policies — for instance, on fiscal choices (Barro and Redlick 2011), tax changes (Mertens and Ravn 2012), or natural resources (Arezki et al. 2017) - can lead to immediate responses. Concretely, my findings suggest

¹² See Figure B1.

¹³ I acknowledge the possibility of spill-overs in that the LCCM's announcement might have also led to a reduction in case numbers in constituencies situated below the threshold, as a result of residents taking actions to prevent the numbers from rising. Thus, the coefficients discussed here should be seen as conservative lower bounds for the announcement's true treatment on the treated effects. Absent spill-overs, I would expect the post-announcement Covid-19 rates recorded in control constituencies to be higher, meaning that the estimates presented in B2, columns (4) to (11), would be larger in absolute value and further away from zero.

⁹ See Appendix A.

¹⁰ In Appendix B, I analyze the validity of the design more in-depth.

¹¹ Which serves as a "sanity check" analysis given that any local behavioral adjustments are unlikely to materialize immediately.

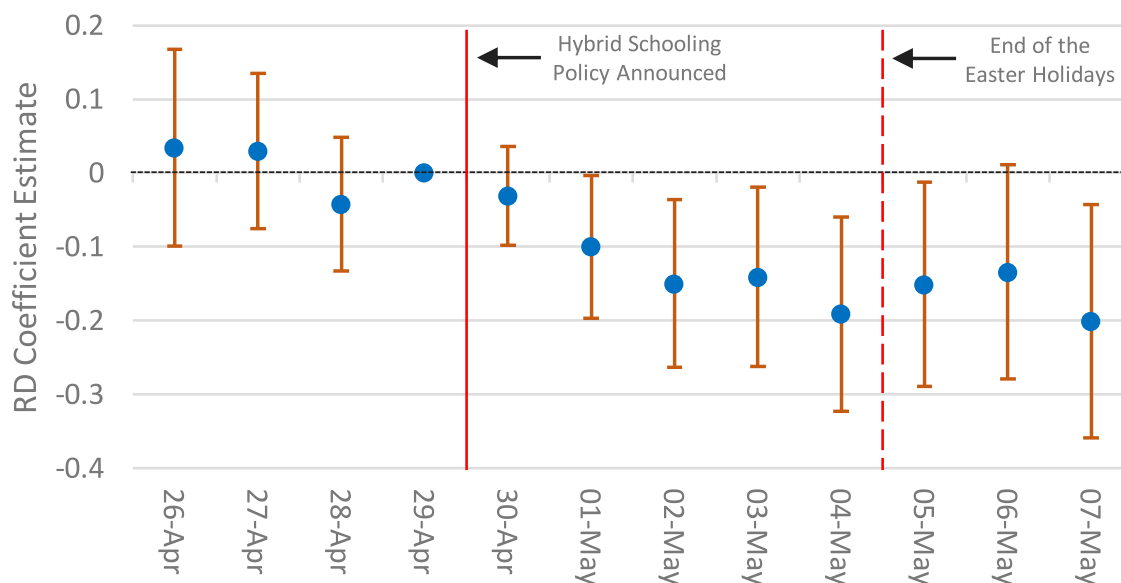


Fig. 3. Main Result – The News-shock Effect of Local Conditional Containment Measures. **Note:** I plot the treatment effect estimates retrieved from fitting the preferred RD specification alongside their 90 percent confidence intervals. The dependent variable is the constituency-level Covid-19 incidence rate per a thousand residents.

that restriction-policies may incentivize indirect actions in targeted communities¹⁴ independently of their mechanical effects, contributing to our understanding of the potential benefits of geographically-flexible lockdowns.

However, the present study has a clear limitation that future work should tackle, in that the exact actions underlying the news-shock effect need to be decomposed – in particular, it is unclear whether the effects are driven by socially “desirable” (e.g., better hygiene practices) or “undesirable” (e.g., test avoidance¹⁵) actions, an important distinction for understanding how effective these policies are in terms of their actual objective: alleviating the virus’s societal burden.

Appendix. Data and Supplementary Analyses

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.econlet.2022.110416>.

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¹⁴ In line with work exploring the use of moral appeals to affect behaviors - e.g., Dal Bó and Dal Bó (2014).

¹⁵ Unfortunately, local-level testing data is not available. See Appendix C for details on an official inquiry I have sent to the Ministry of Health concerning this matter.